



A statistical modeling framework for projecting future ambient ozone and its health impact due to climate change

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Abstract:

The adverse health effects of ambient ozone are well established. Given the high sensitivity of ambient ozone concentrations to meteorological conditions, the impacts of future climate change on ozone concentrations and its associated health effects are of concern. We describe a statistical modeling framework for projecting future ozone levels and its health impacts under a changing climate. This is motivated by the continual effort to evaluate projection uncertainties to inform public health risk assessment. The proposed approach was applied to the 20-county Atlanta metropolitan area using regional climate model (RCM) simulations from the North American Regional Climate Change Assessment Program. Future ozone levels and ozone-related excesses in asthma emergency department (ED) visits were examined for the period 2041-2070. The computationally efficient approach allowed us to consider 8 sets of climate model outputs based on different combinations of 4 RCMs and 4 general circulation models. Compared to the historical period of 1999-2004, we found consistent projections across climate models of an average 11.5% higher ozone levels (range: 4.8%, 16.2%), and an average 8.3% (range:-7%-24%) higher number of ozone exceedance days. Assuming no change in the at-risk population, this corresponds to excess ozone-related ED visits ranging from 267 to 466 visits per year. Health impact projection uncertainty was driven predominantly by uncertainty in the health effect association and climate model variability. Calibrating climate simulations with historical observations reduced differences in projections across climate models.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

Climate Change and Human Health Literature Portal



weather or climate related pathway by which climate change affects health

Air Pollution, Precipitation, Solar Radiation, Temperature

Air Pollution: Interaction with Temperature, Ozone, Other Air Pollution

Air Pollution (other): NOx; VOC

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Respiratory Effect

Respiratory Effect: Asthma

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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